

Resonating group method study of baryon-meson systems in a chiral quark model

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Using the resonating group method (RGM), we dynamically studied several baryon-meson systems in the chiral SU(3) quark model and the extended chiral SU(3) quark model, which have been quite successful in describing the nucleon-nucleon and nucleon-hyperon scatterings. Some interesting results are obtained:

1) The ΣK state with isospin $I=1/2$ has an attractive interaction, which consequently results in a ΣK quasibound state. When the channel coupling of ΣK and ΛK is considered, a sharp resonance appears between the thresholds of these two channels with spin-parity $J^P=1/2^-$.

2) The S-wave interaction of ΔK state with isospin $I=1$ is attractive, which can make for a ΔK quasibound state. While for isospin $I=2$, the interaction is repulsive.

3) The $N\phi$ state has an attractive interaction, which is dominantly provided by the σ exchange. In the extended chiral SU(3) quark model, such an attraction plus the effect of the channel coupling to ΛK^* can consequently make for an $N\phi$ bound state with several MeV binding energy.

4) A satisfactory description of the S-, P-, D-, and F-wave KN phase shifts is obtained. Comparison with other's previous quark model study, our results achieve a considerable improvement in both the signs and the magnitudes.

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